

The goal of the **Atmospheric Science Program** of the Department of Energy (DOE) is to develop a comprehensive understanding of the atmospheric processes that control the transport, transformation, and fate of energy related chemicals and particulate matter

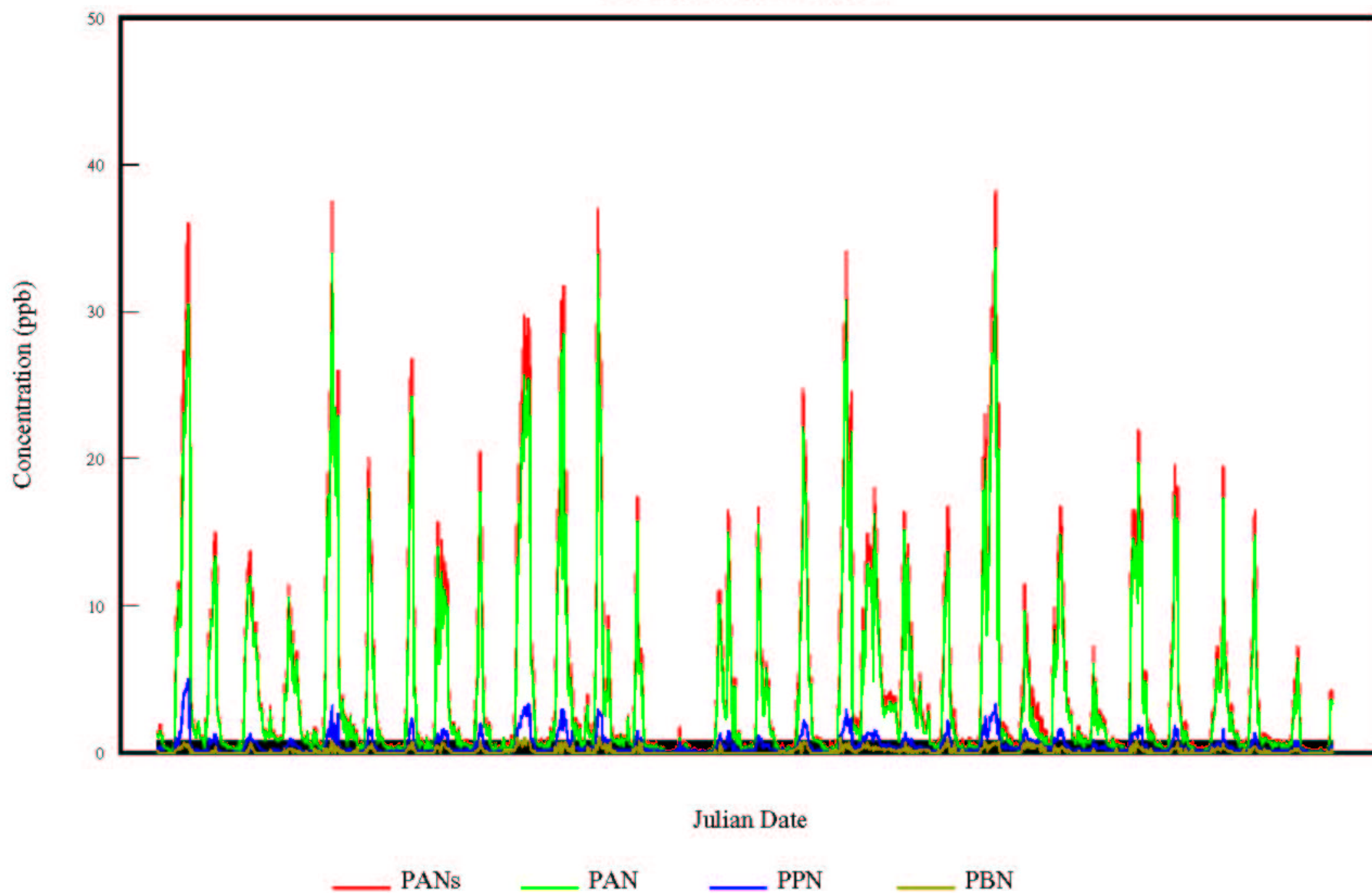
**Atmospheric Chemistry Program**  
**Environmental Meteorology Program**  
**Tropospheric Aerosol Program**

## Examples of Past Major Collaborative ASP Field Campaigns

North Atlantic Regional Experiment (NARE)	Nova Scotia	Aug-Sept,	1992
NARE Intensive Period	Nova Scotia	Aug-Sept,	1993
Southern Oxidant Study	Nashville, TN	June-July,	1995
NARSTO Northeast Study	New England	Aug-Sept,	1995
NARSTO Intensive Campaign	New England	July-Aug,	1996
Mexico City Study	Mexico City	Feb-March,	1997
Phoenix Air Chemistry Study	Phoenix, AZ	May-June,	1998
NARSTO Southern Oxidants Study	Nashville, TN	Jun-July,	1999
NARSTO Northeast Oxidant and Particle Study (NEOPS)	Philadelphia, PA	July-Aug,	1999
Central California Ozone Study (CCOS) Summer Intensive	Fresno, CA	Jun-July,	2000
Texas Air Quality Study (TexAQS 2000)	Houston, TX	Aug-Sept,	2000
Phoenix II	Phoenix, AZ	July-Aug,	2001
Vertical Transport and Mixing (VTMX)	Salt Lake City, UT	Oct,	2000

# Measurements of PANs - IMP, Mexico City

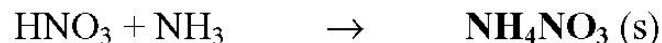
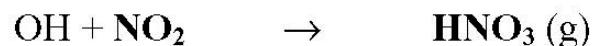
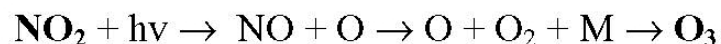
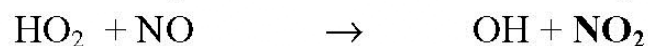
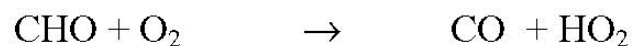
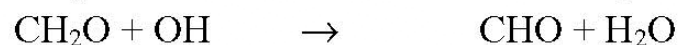
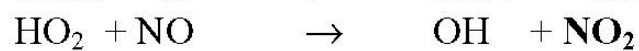
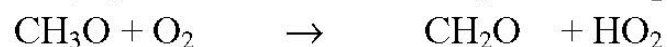
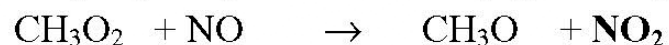
February 20-March 23, 1997



## **Regional Impacts of Mexico City Plume**

PANs can act as source of organic radicals and  $\text{NO}_2$  in long range transport leading to formation of ozone and other oxidants, particularly peracids from  $\text{HO}_2$  reactions when  $\text{NO}$  levels become low.

### **Thermal Decomposition of PAN in the presence of $\text{NO}$ leads to the formation of Ozone and Nitrate Aerosols**



### **Under LOW $\text{NO}$ Conditions**

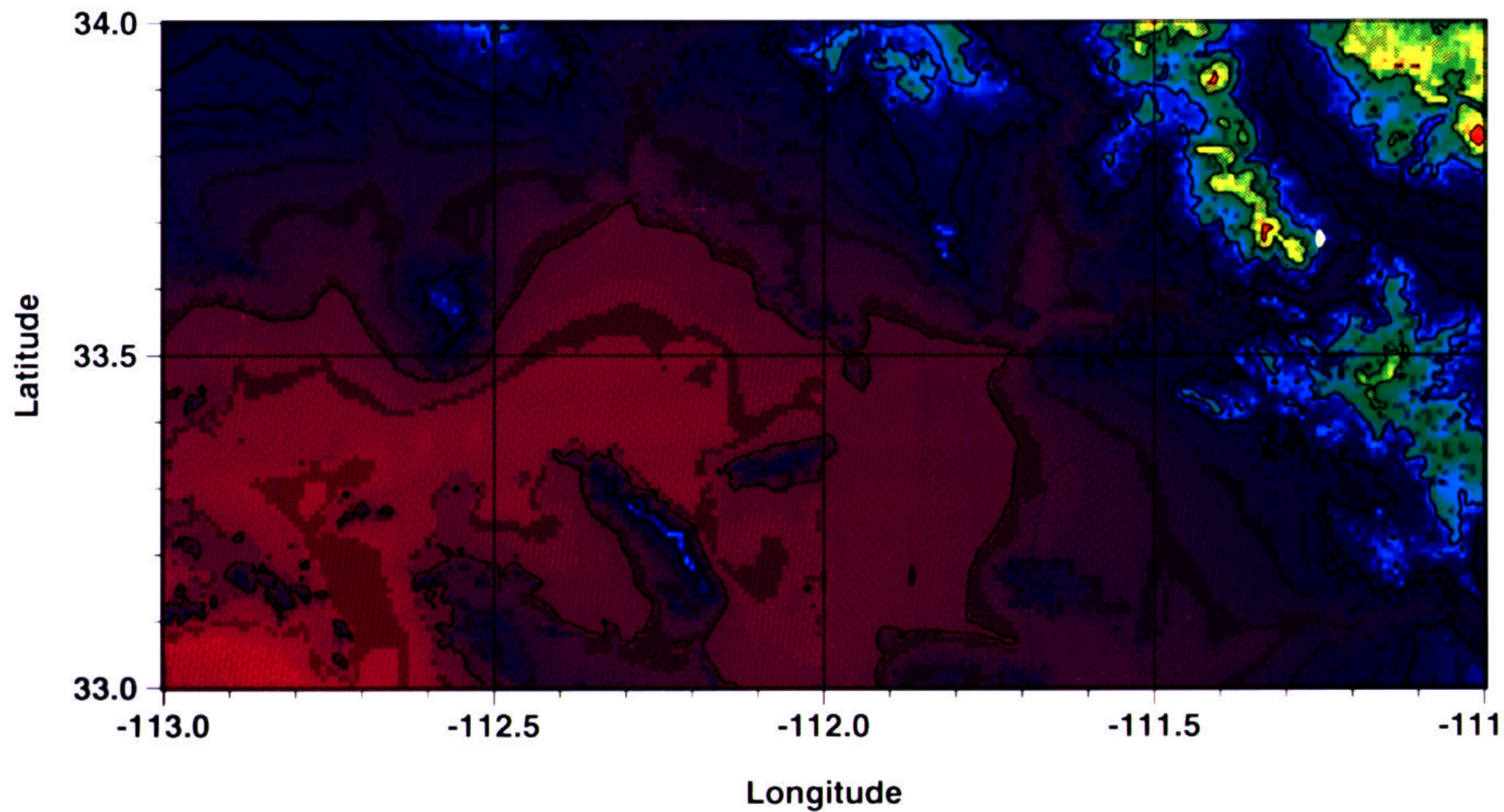


### **Estimated Mass of Emissions in Mexico City Plume**

<u>Pollutant</u>	<u>Concentration</u>	<u>Metric Tons per Day</u>	<u>Mega-Tons per Year</u>
NMHC	1 ppmC	4500	1.6
CO	5 ppm	43,000	16
NO <sub>2</sub>	50 ppb	710	0.26
Ozone	200 ppb	3000	1.1
PAN	20 ppb	750	0.27
PM-2.5	50µg/m <sup>3</sup>	40,000	15

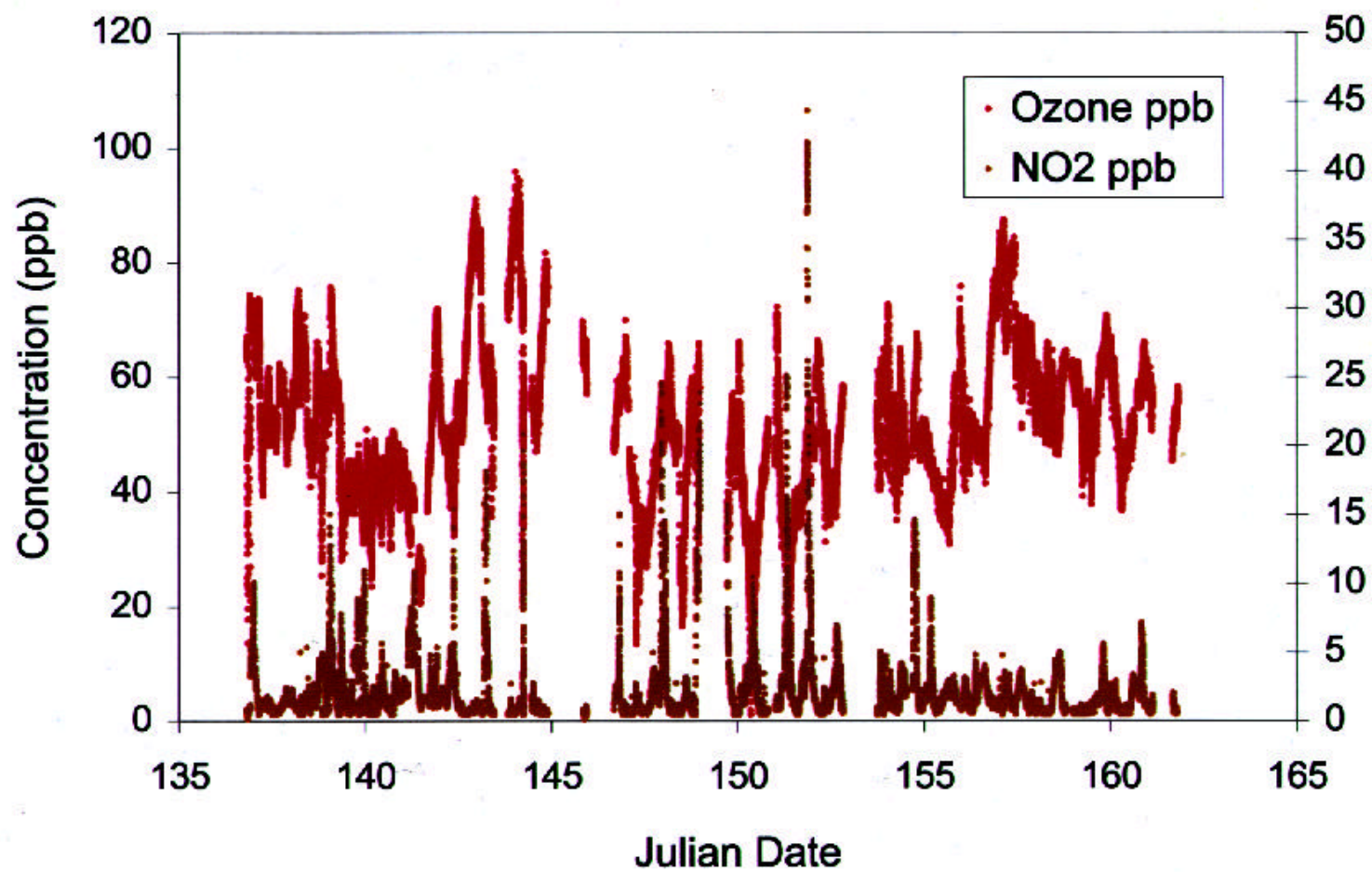
Assumptions: 770 mbar, 27 C, 2 km mixing layer, 5000 km<sup>2</sup> Metropolitan Area, no dry deposition, Air Mass is completely mixed and flushed out once a day.

# Phoenix Area Topography

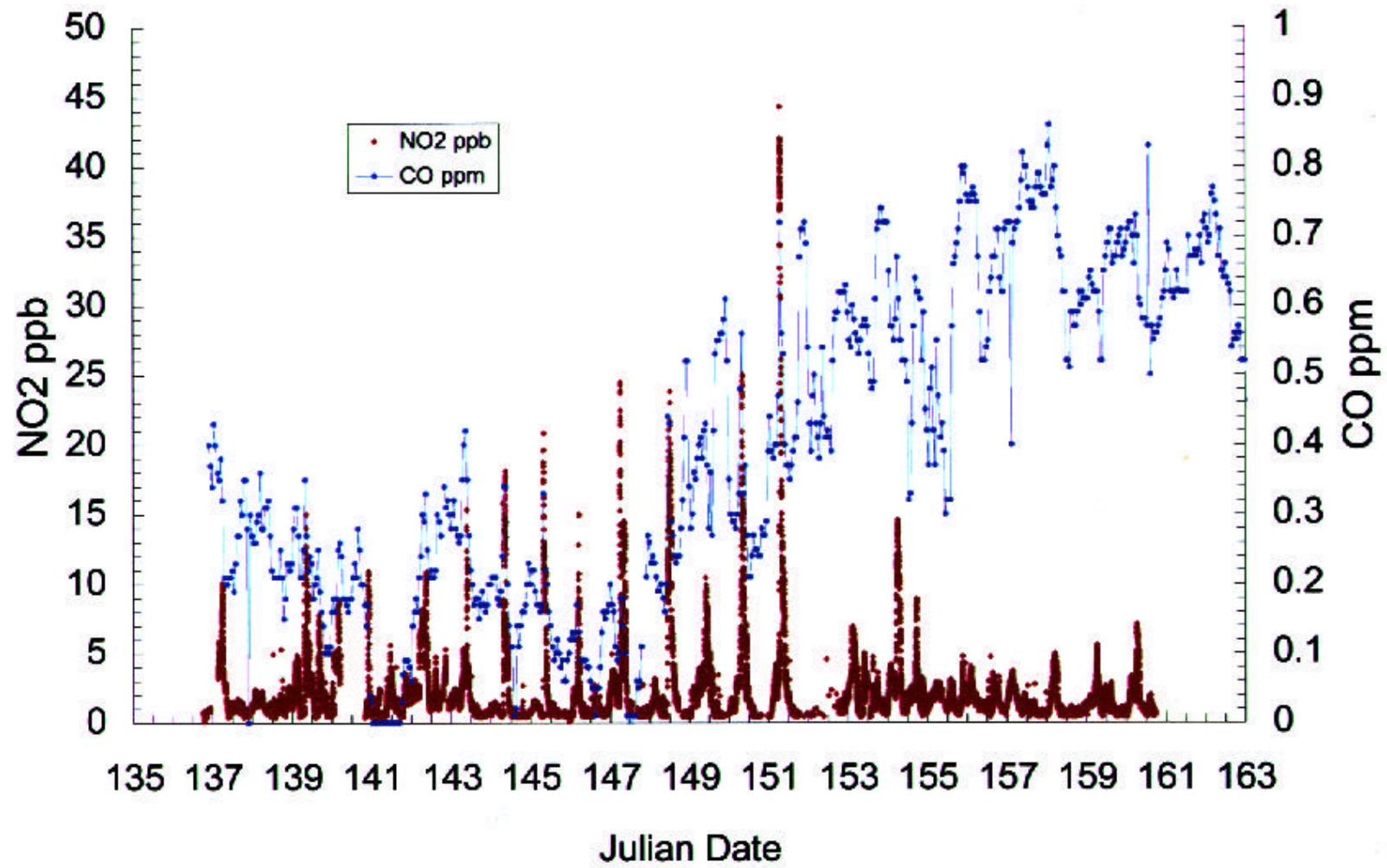




### O3 and NO2 - Usery Mtn

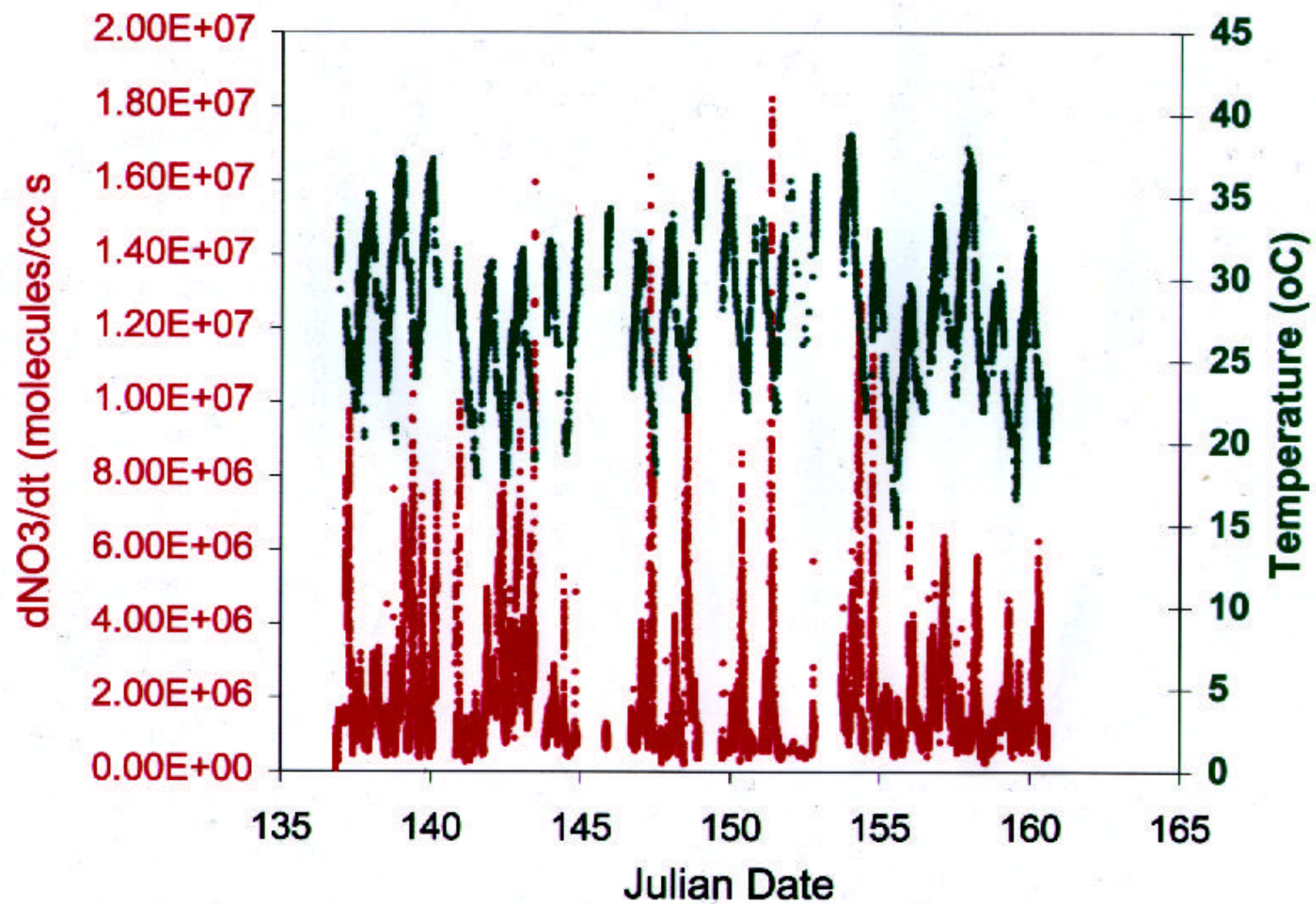


# NO2, CO Usery Pass, Mesa AZ 1998

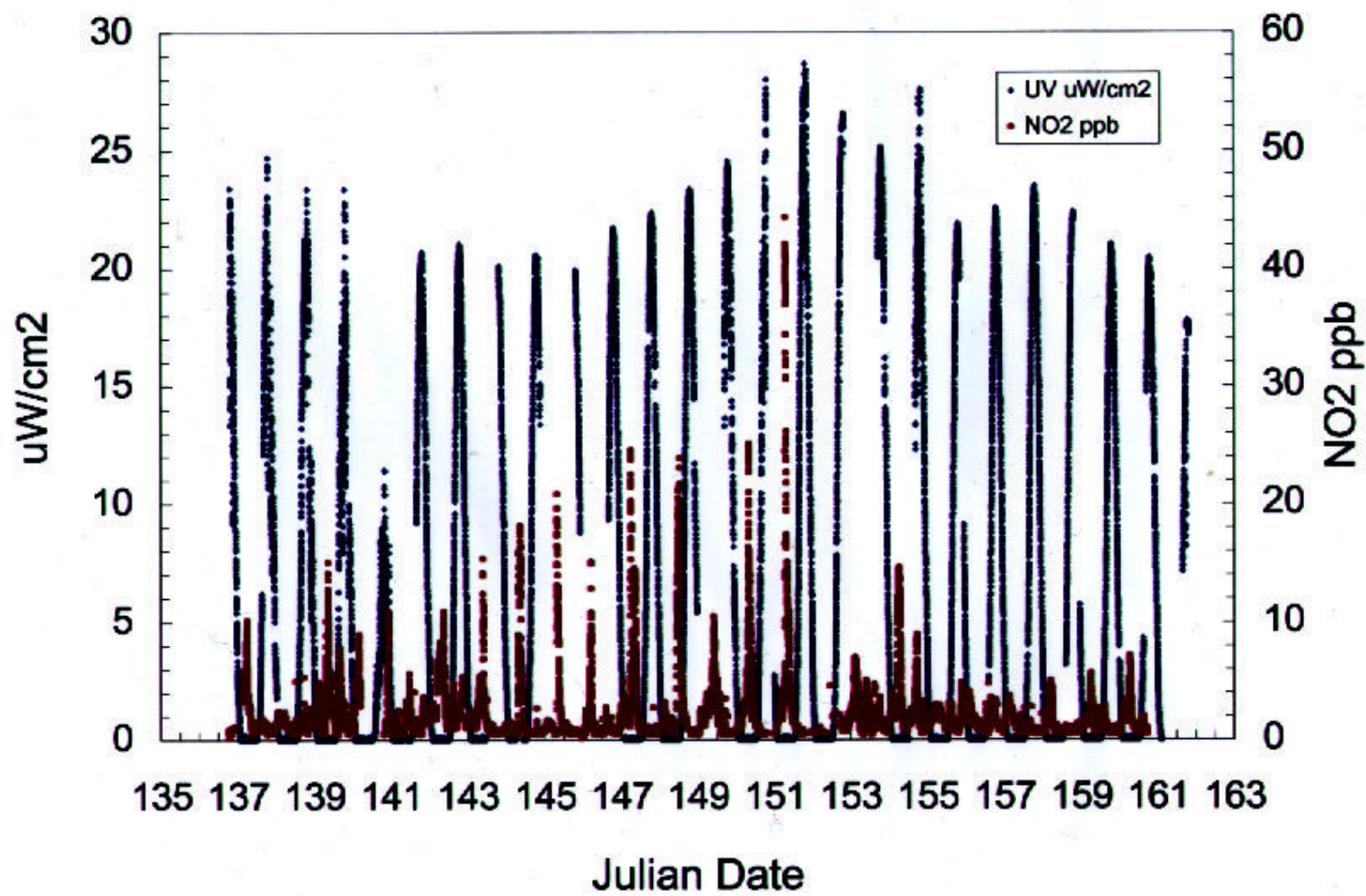




**d[NO<sub>3</sub>]/dt and Temp at Usery Pass**



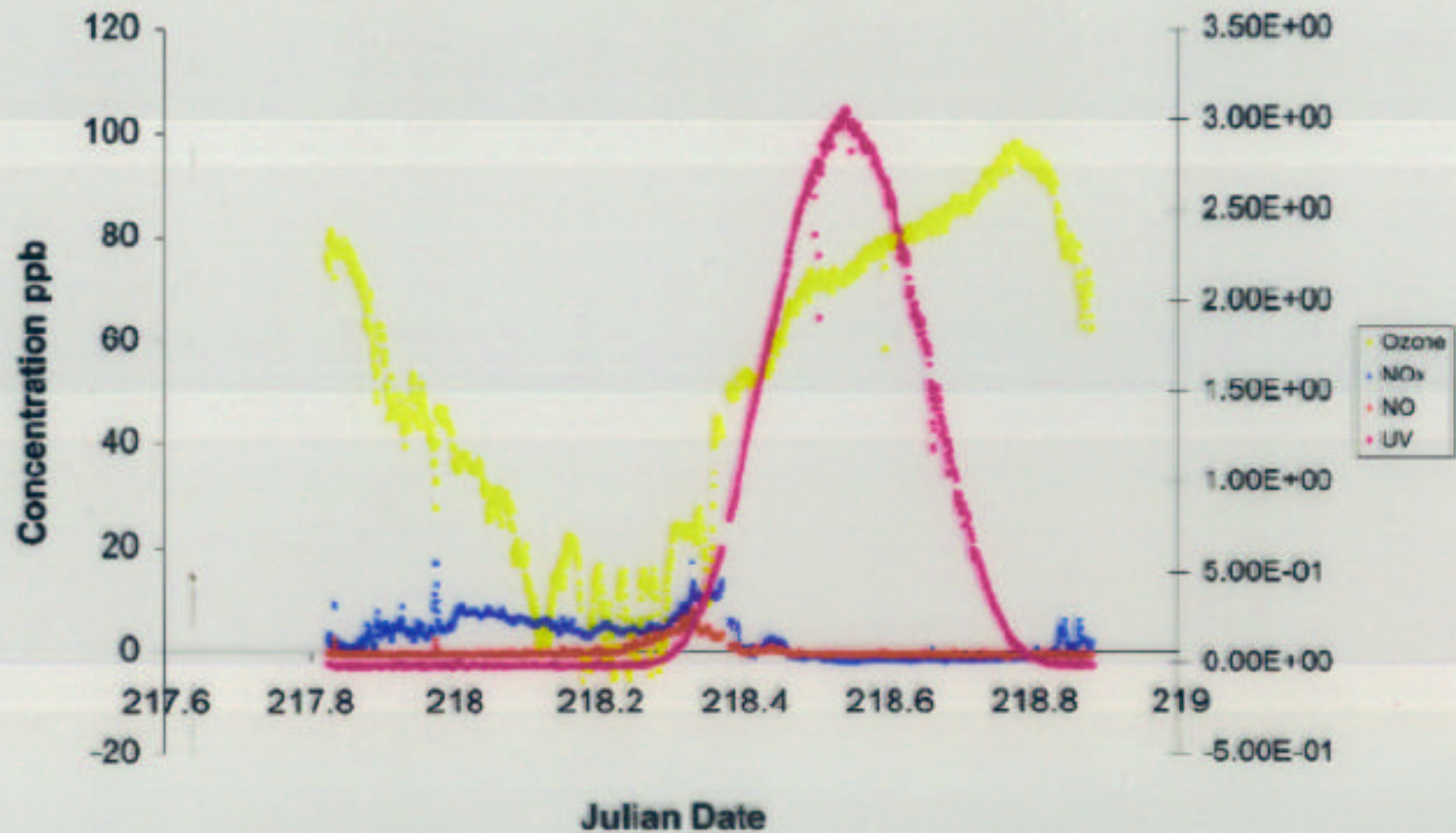
# UV, NO2 User Pass, Mesa AZ 1998





# NEOPS - Centerton, NJ

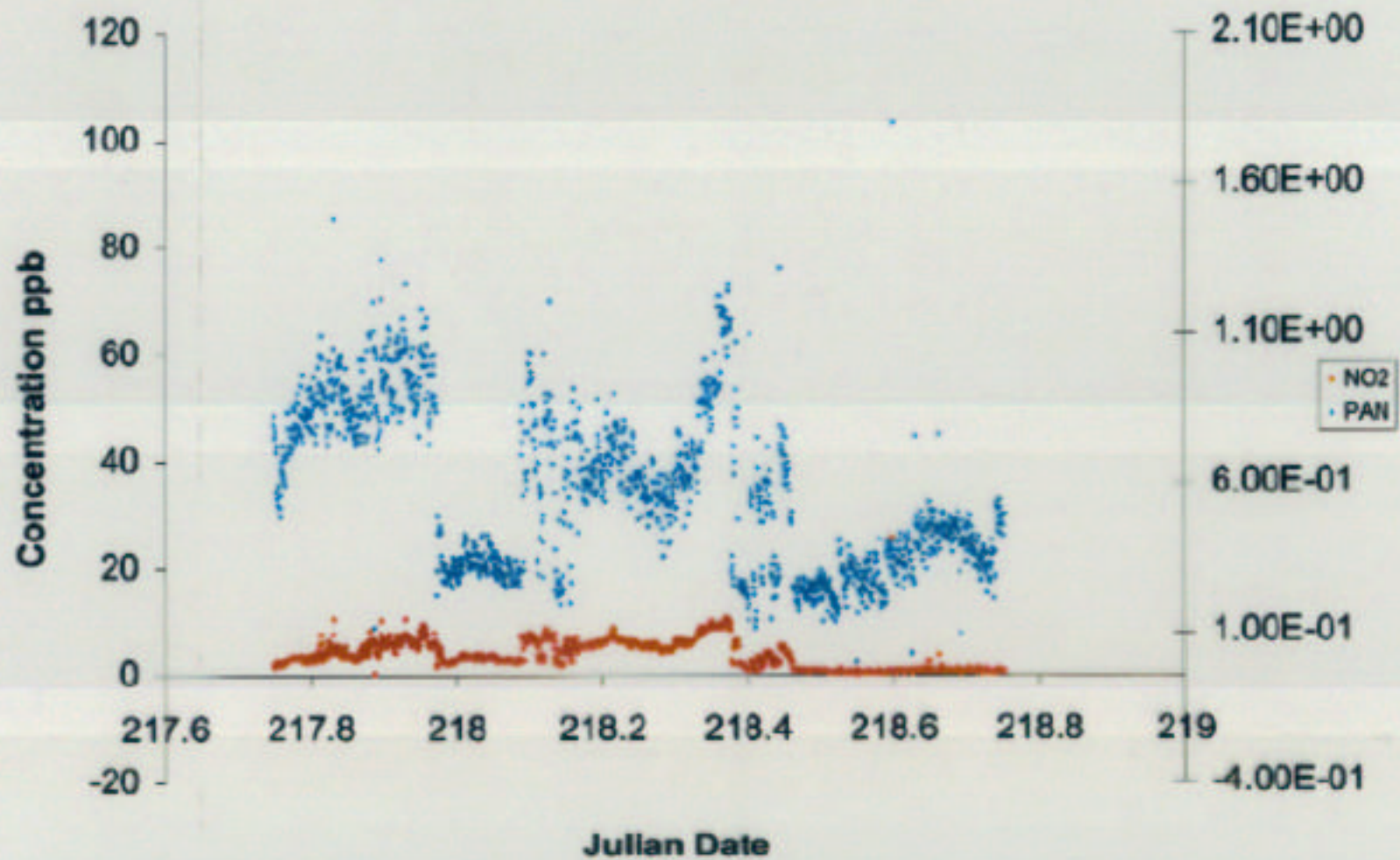
RAW DATA



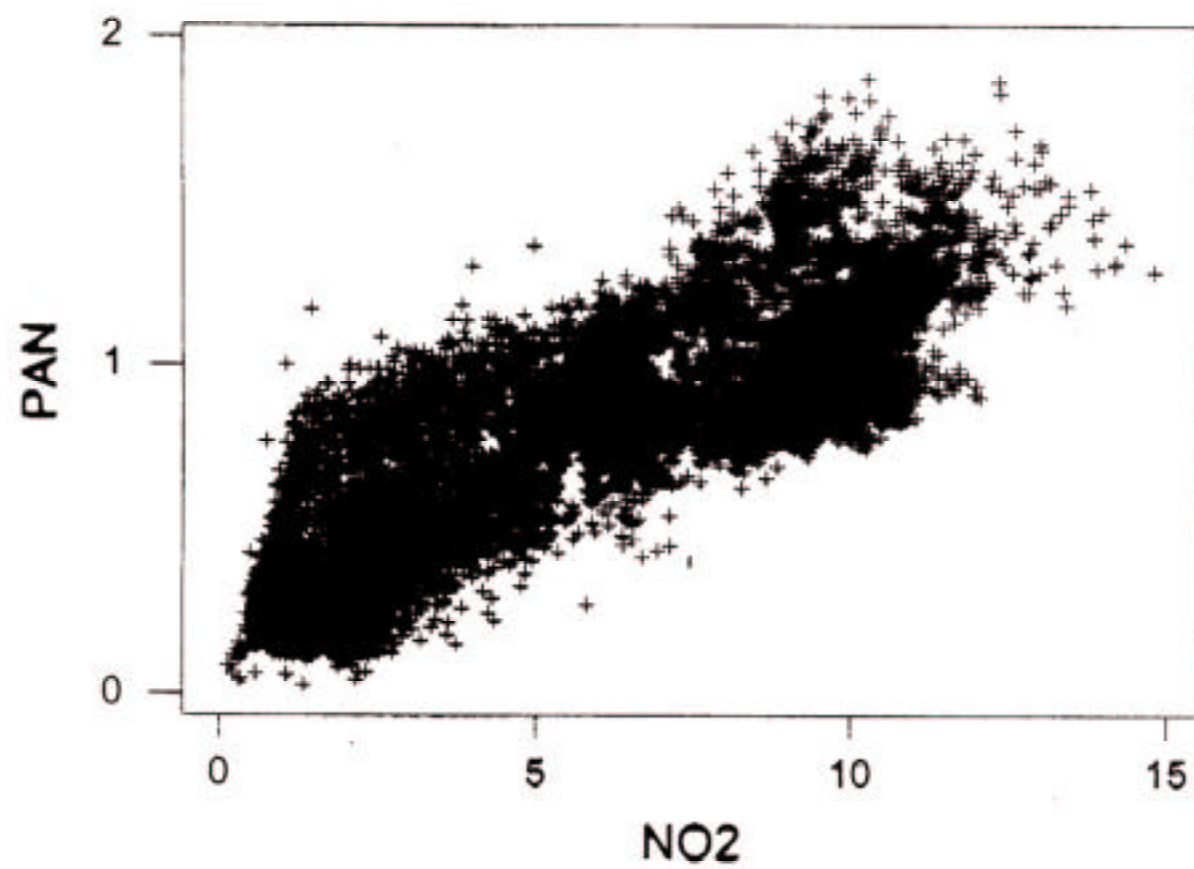
# NEOPS - Centerton, NJ

## Luminol Detection System

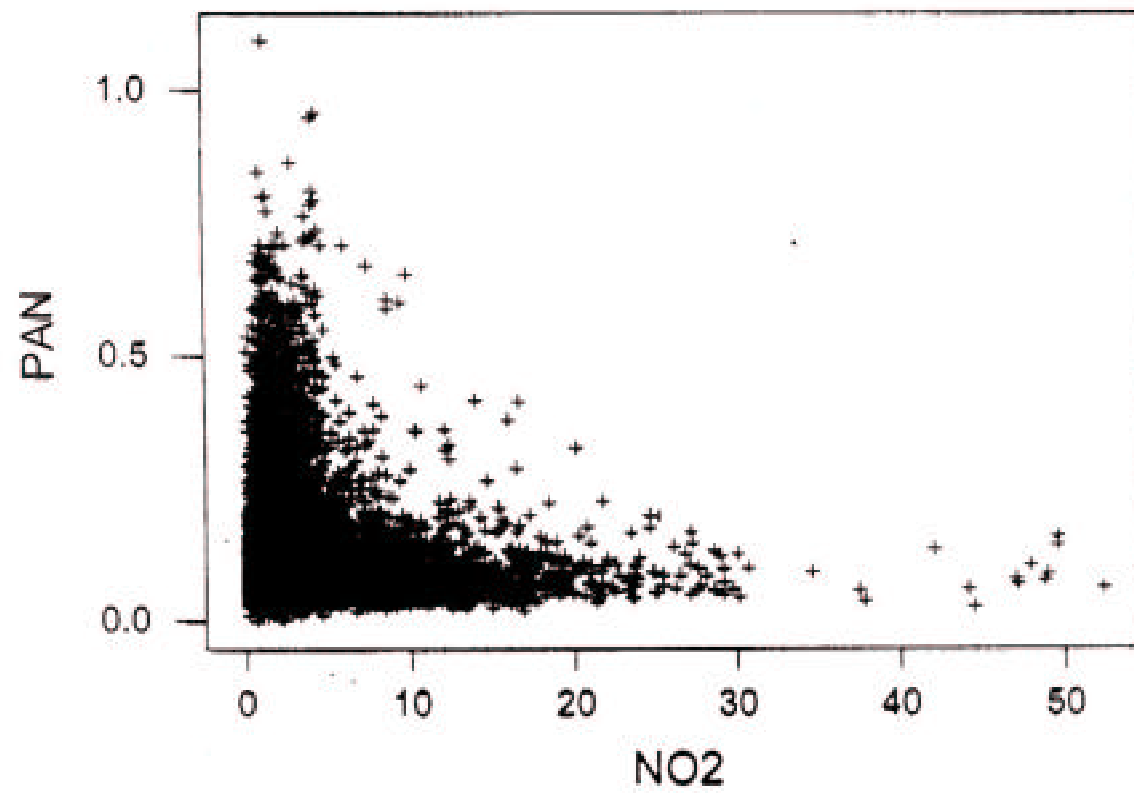
### NO<sub>2</sub> and PAN



## New Jersey

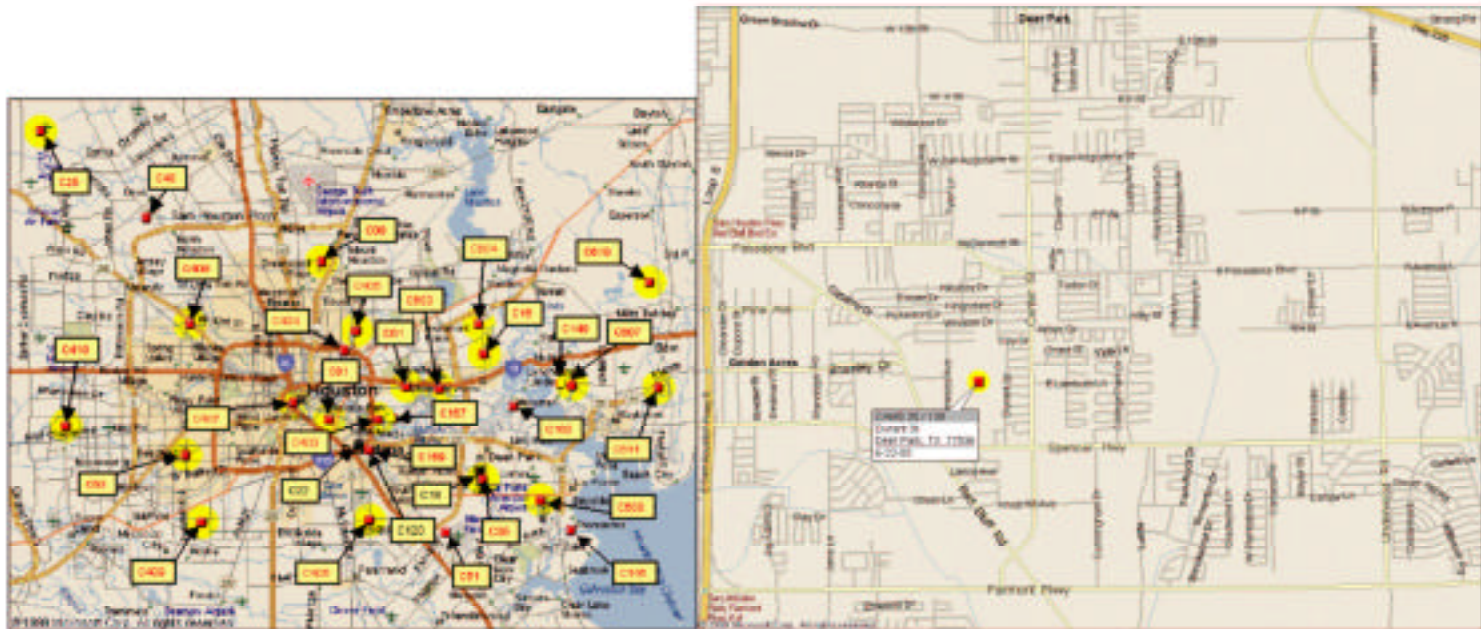


# Phoenix

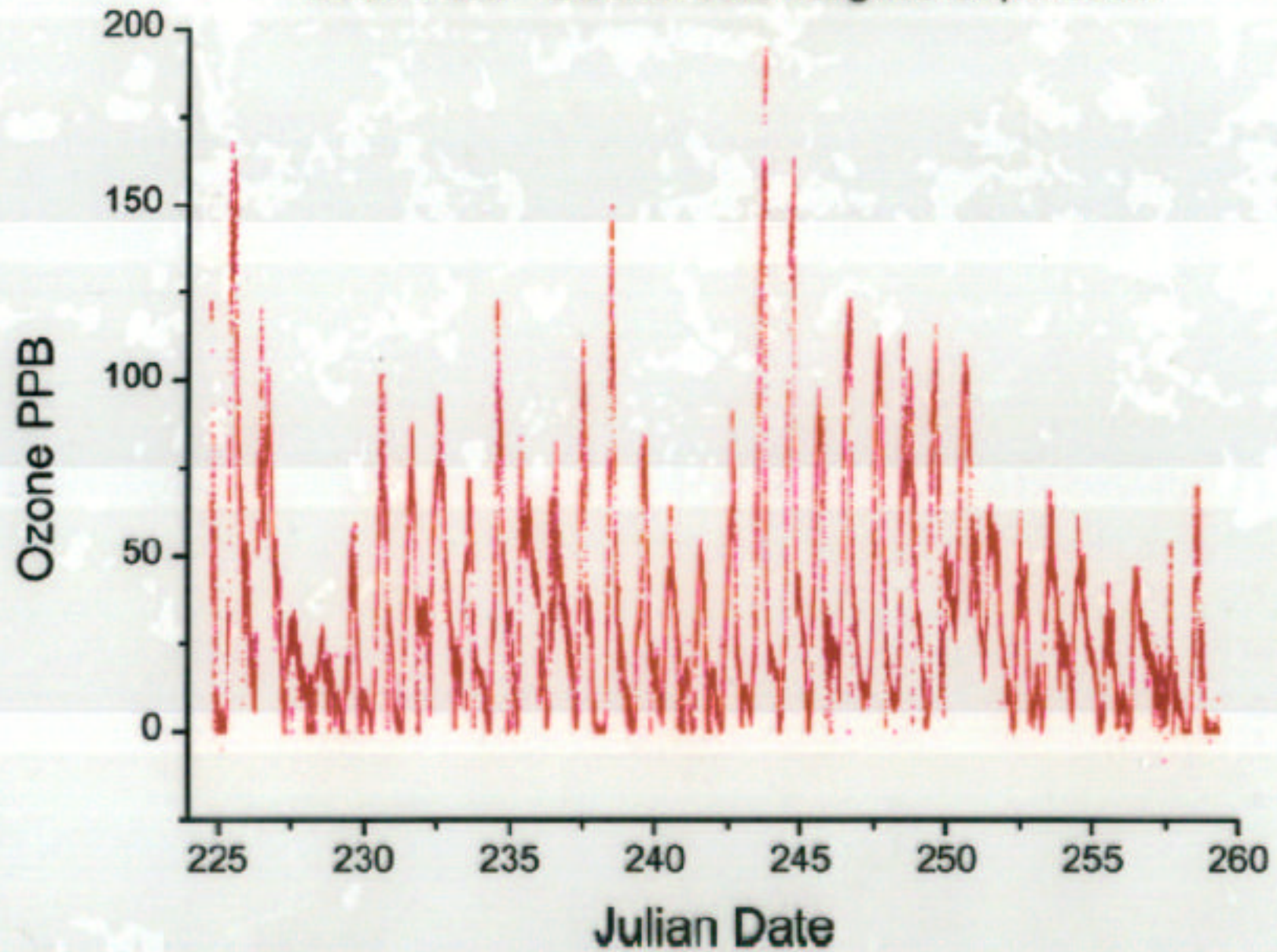




## Maps showing site 35. Deer Park Location.

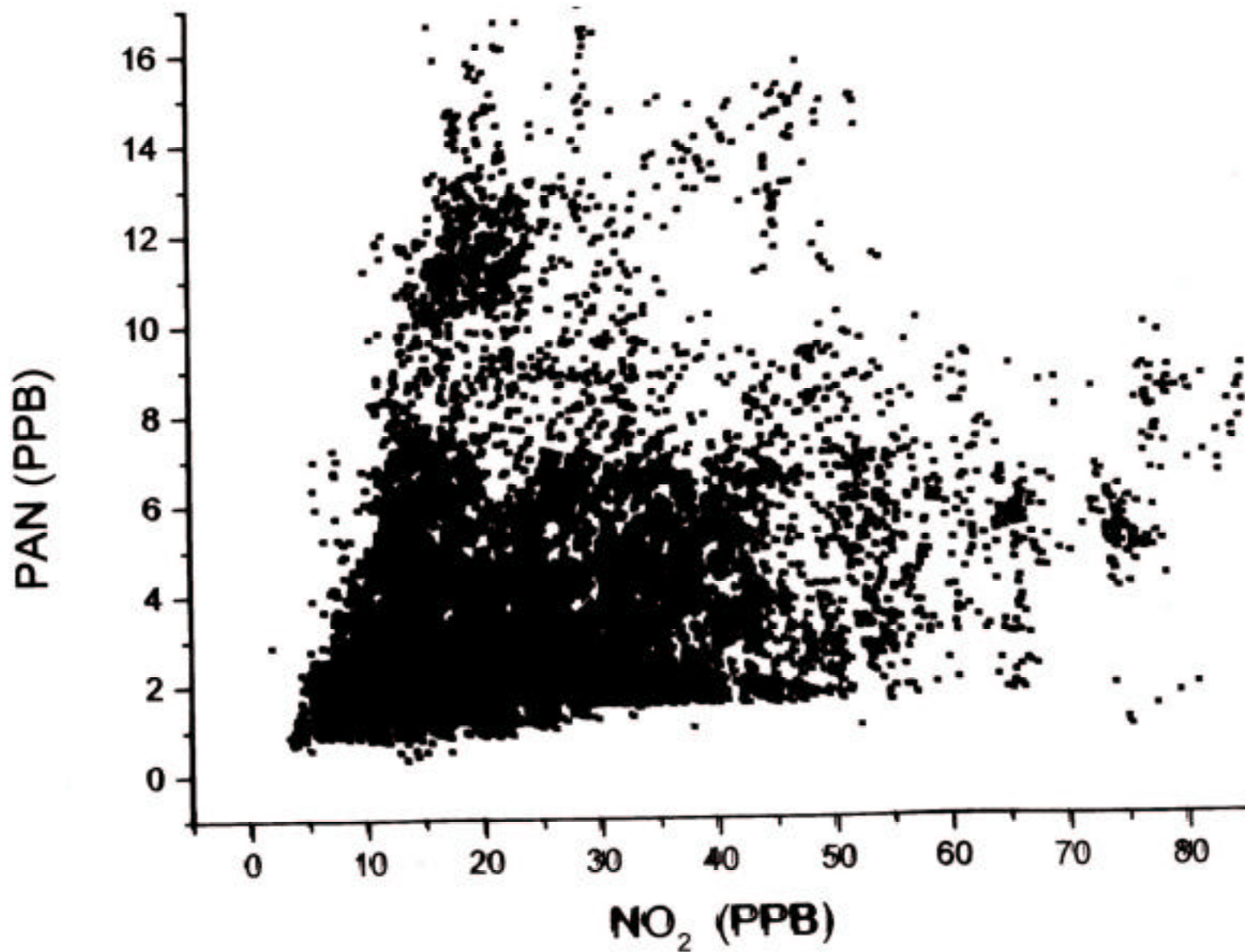


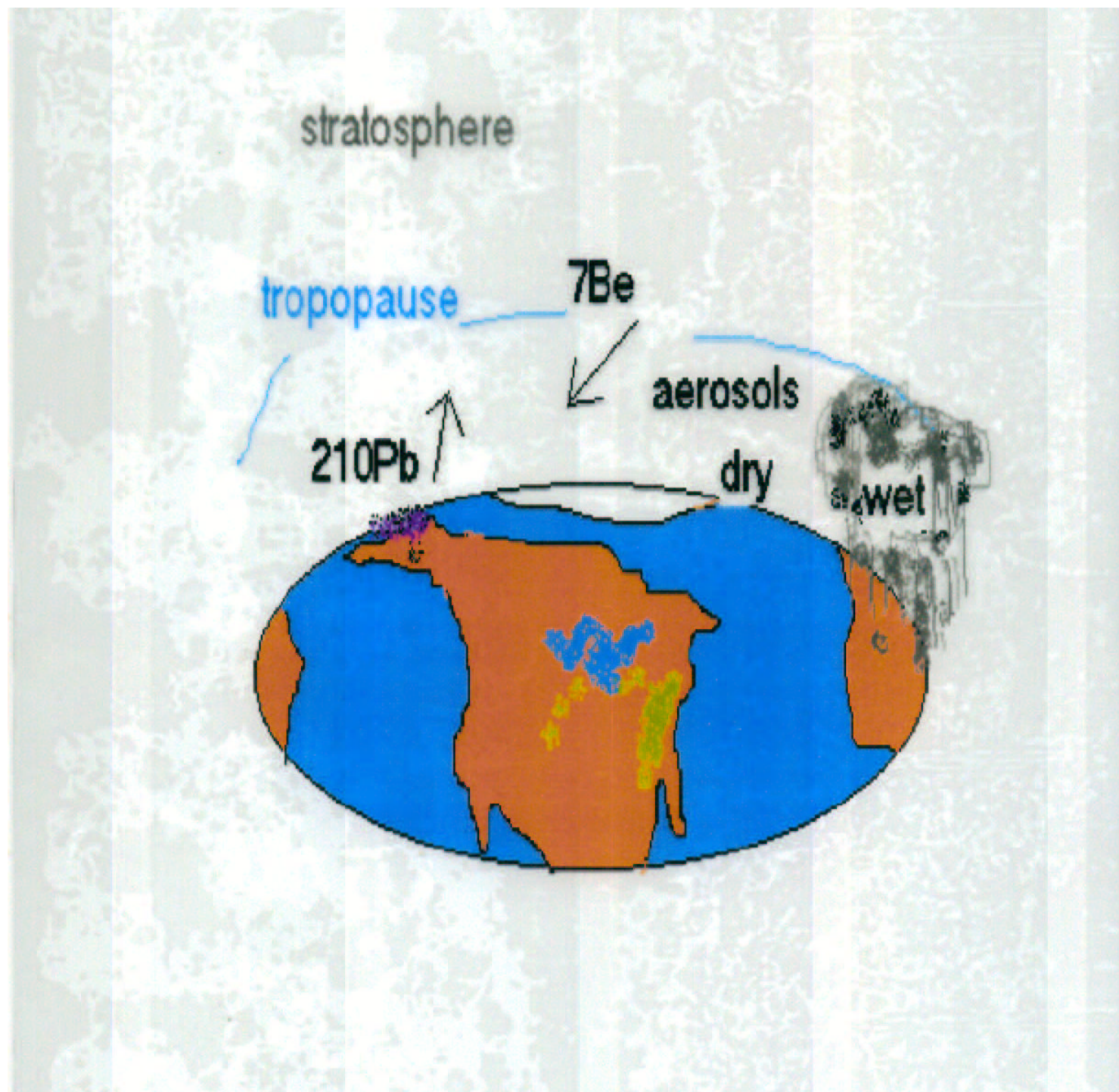
Deer Park - Ozone Data August-Sept. 2000





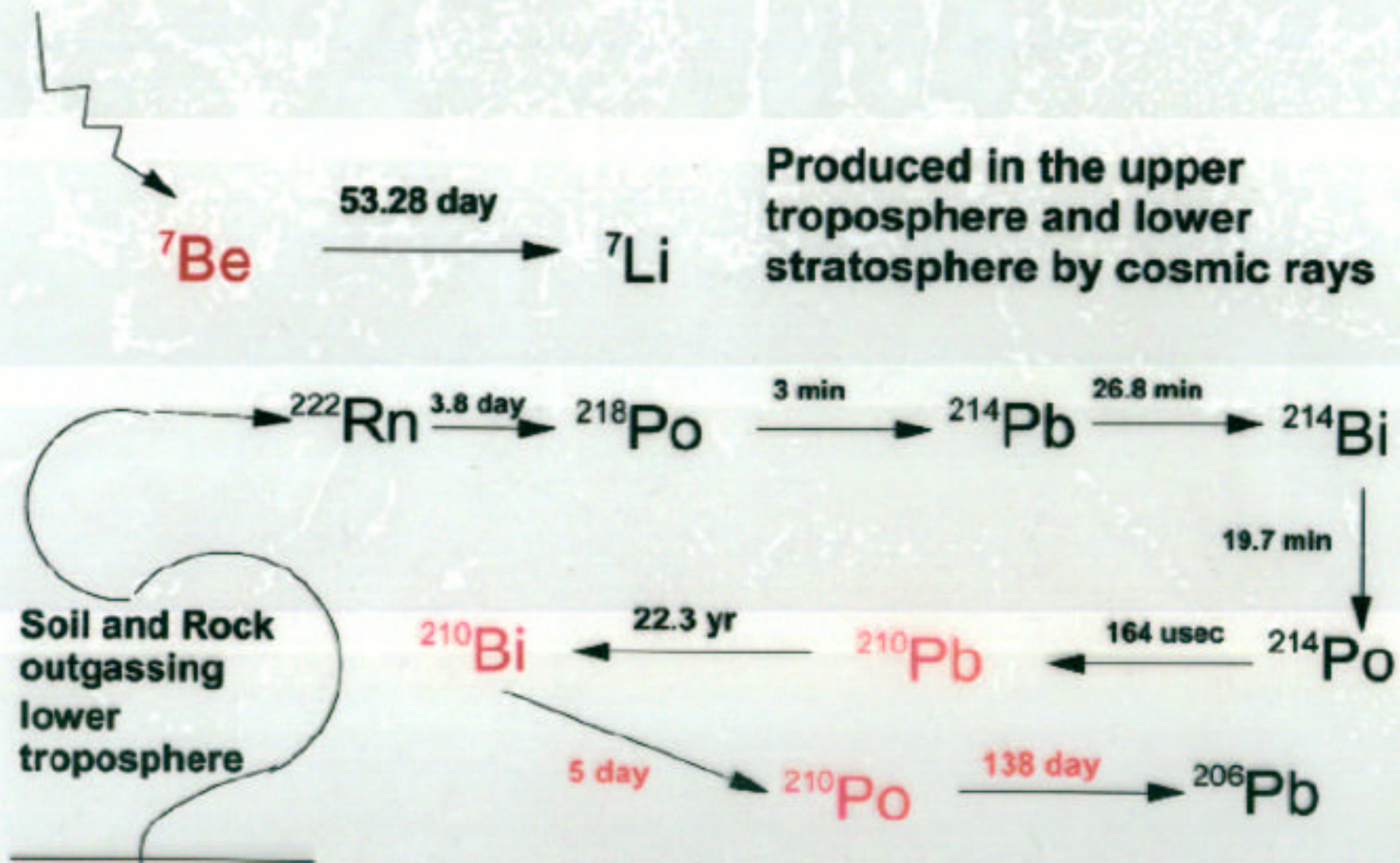
# DEER PARK (Texas 2000)

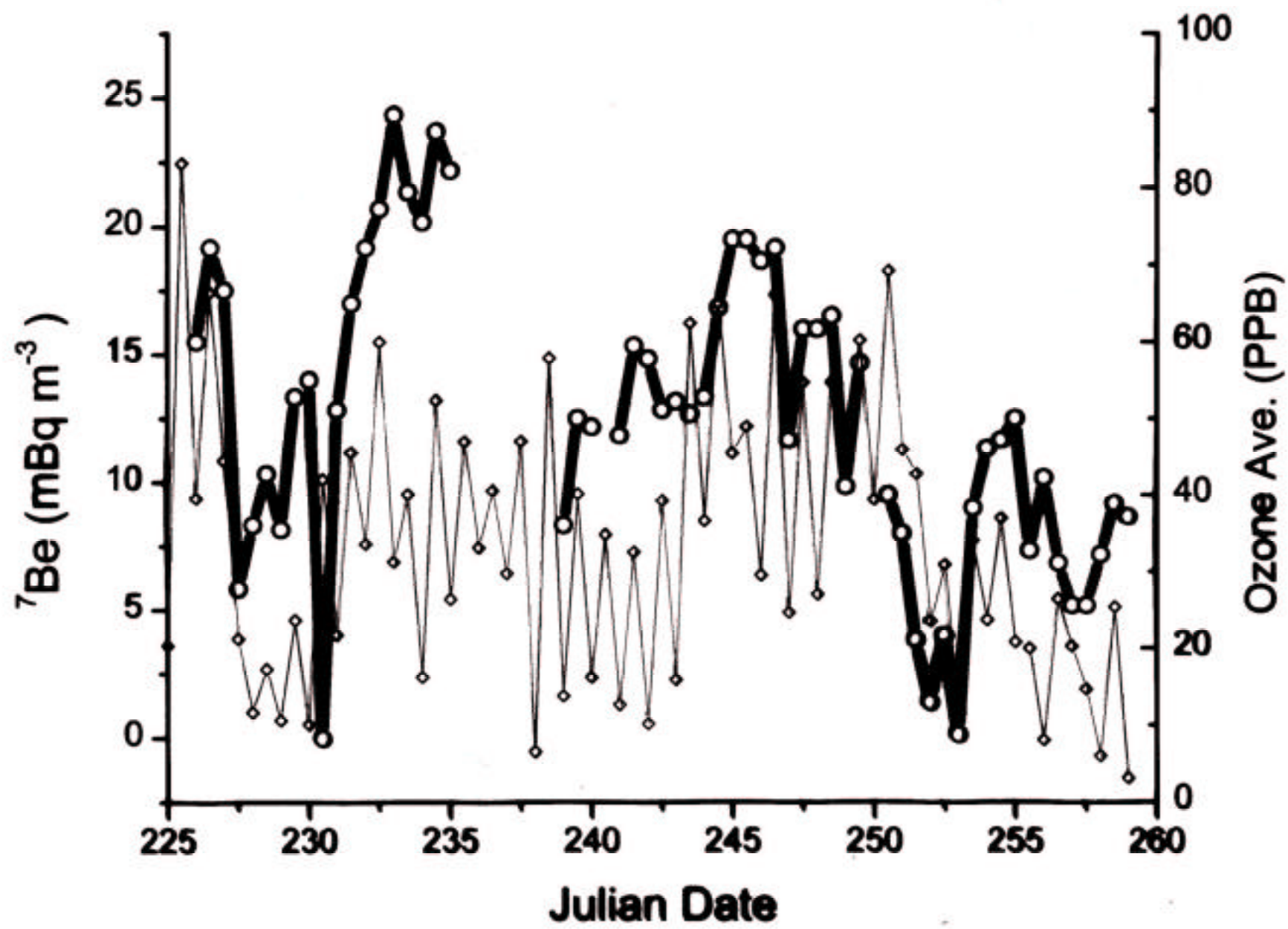






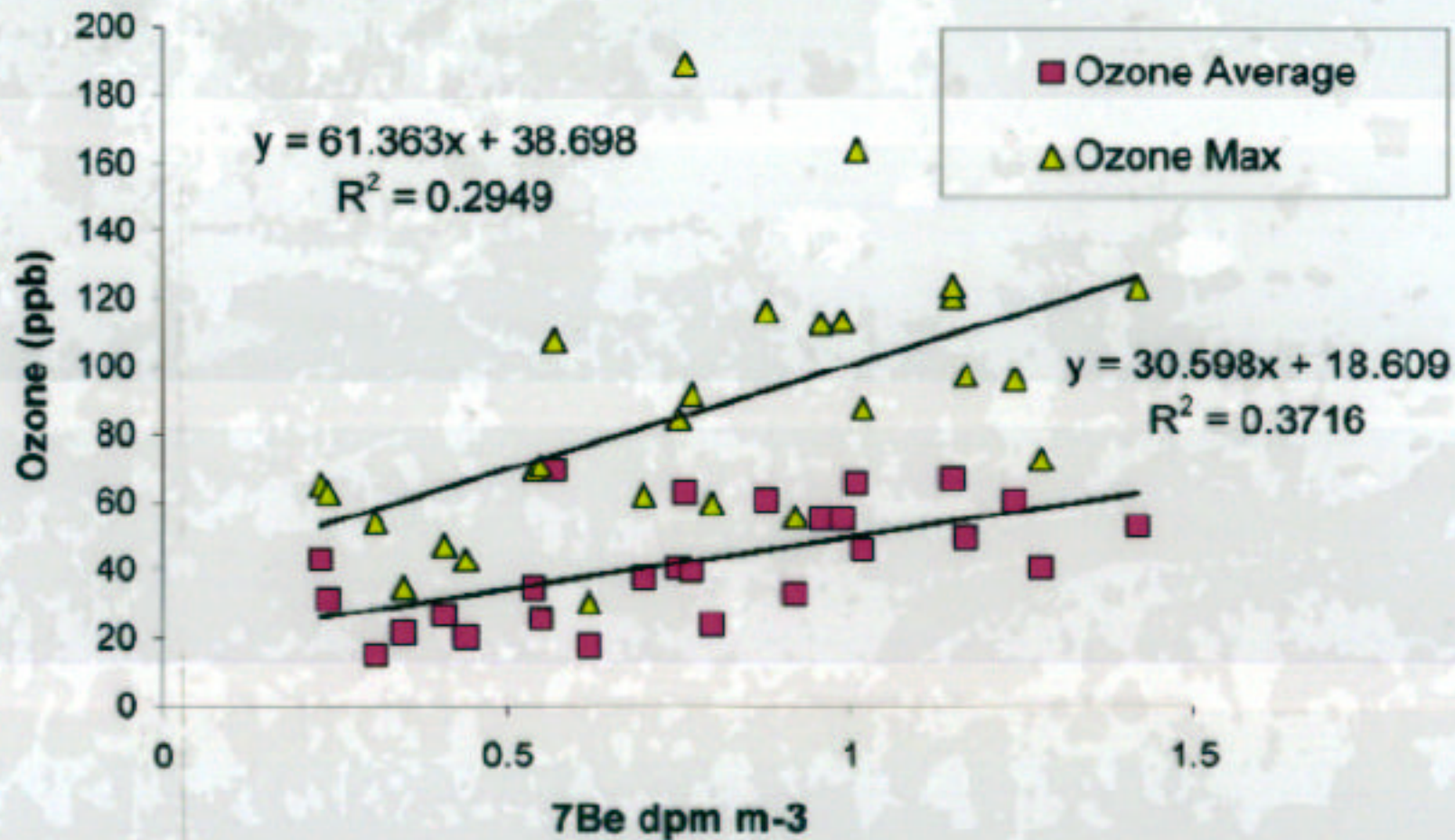
## Radioactive Decay of Natural Atmospheric Tracers



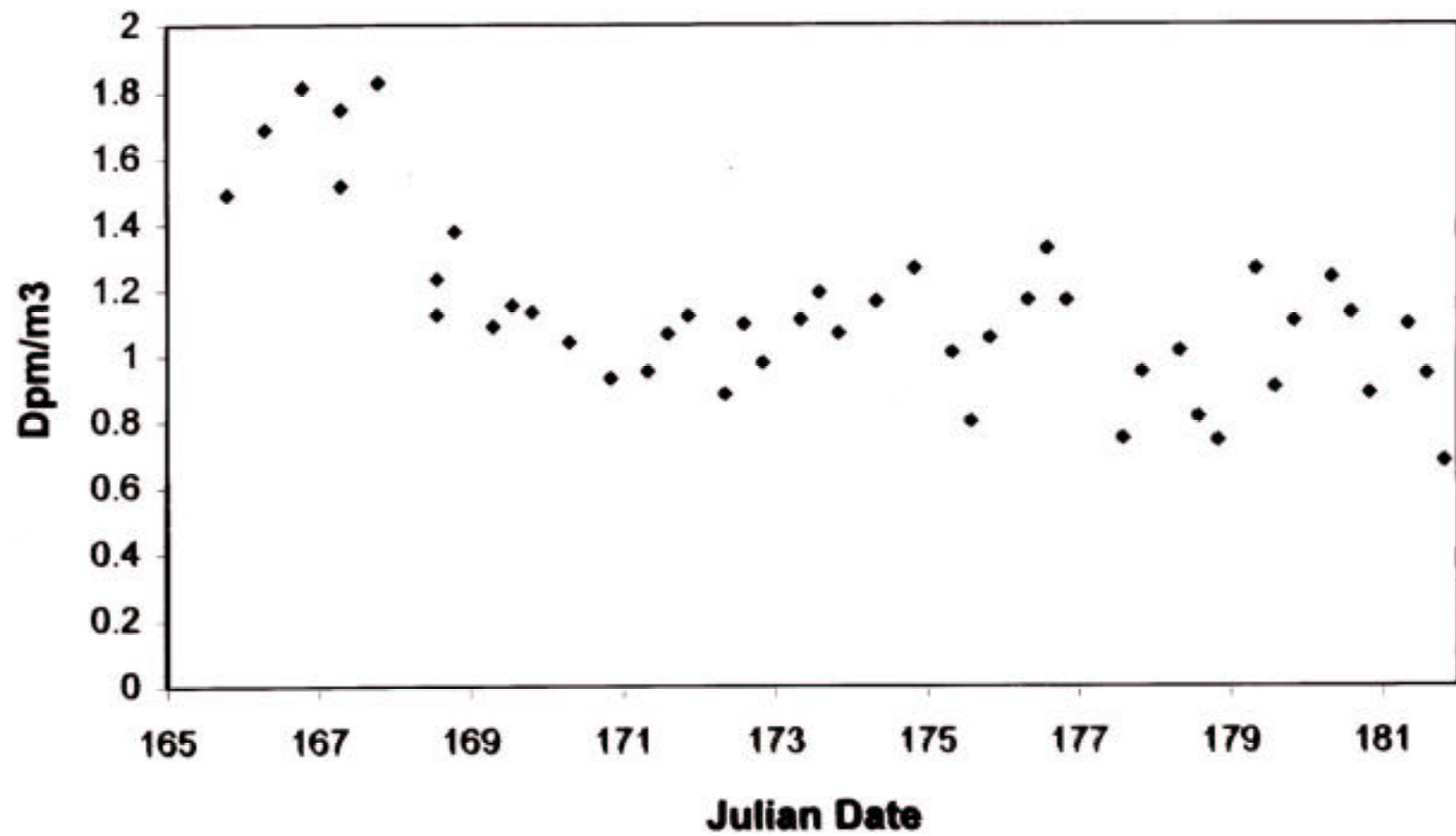




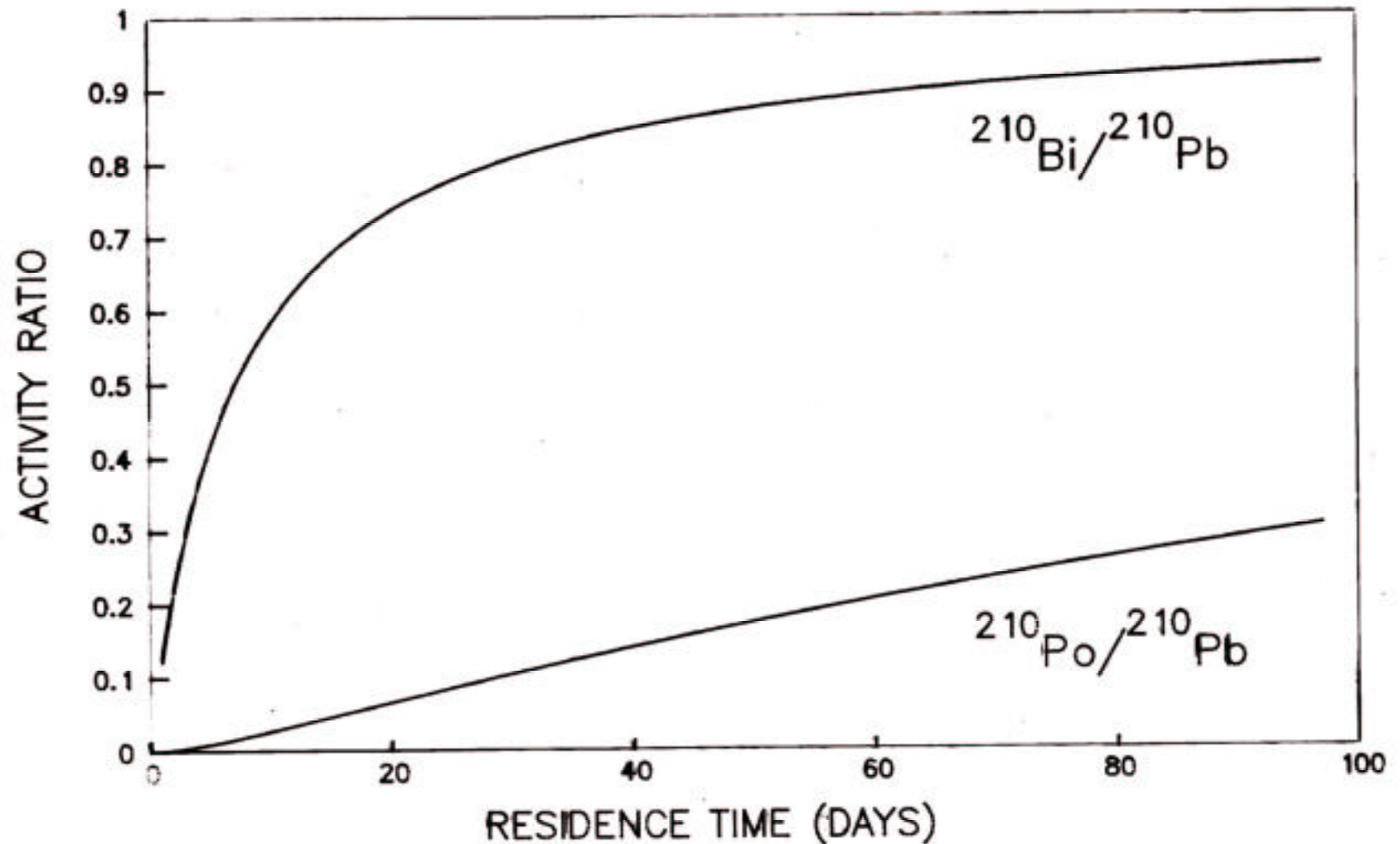
### 12 Hour 7Be - Daytime - Deer Park, TX



# PHOENIX 2001 Be-7 Dpm/m<sup>3</sup> vs Julian Date



## Activity Ratio vs Residence Time for Aerosols Removed in Precipitation



(adapted from Nevissi, A.E. 1991, J. Radioanal. Nucl. Chem.)



## Residence Times Calculated from $^{210}\text{Bi}/^{210}\text{Pb}$ Activity Ratios

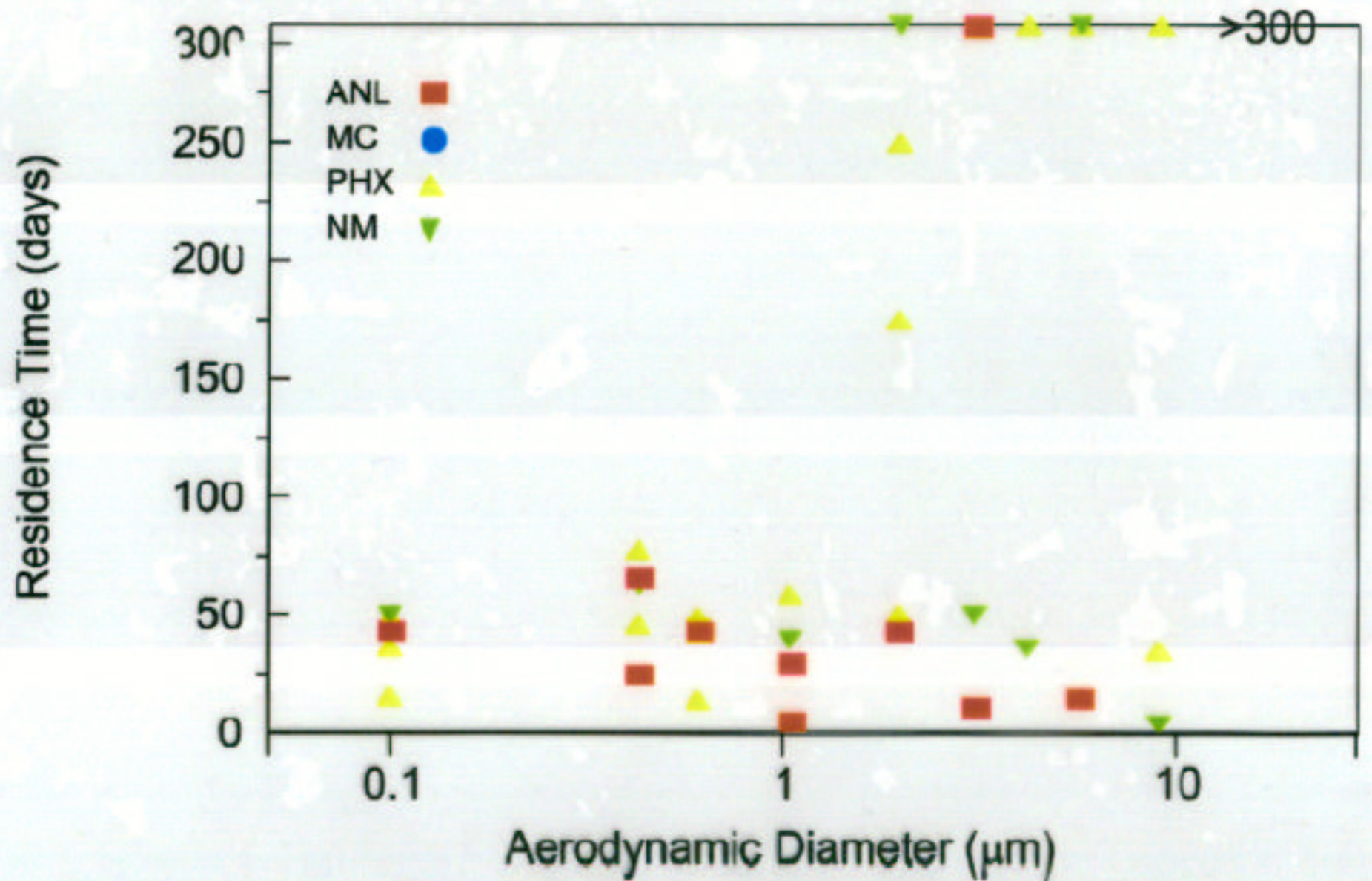


Table 1. Aerosol residence times calculated from the  $^{210}\text{Po}/^{210}\text{Pb}$  ratios for samples collected at Centerton.

Date in 1999	D ( $\mu\text{m}$ )	$^{210}\text{Po}/^{210}\text{Pb}$	Age (days)
7/24-7/30	9.2	0.112	32
	5.8	0.139	39
	4.2	0.142	40
	3.1	0.107	31
	2.0	0.177	50
	1.05	0.156	44
	0.62	0.125	35
	0.43	0.101	29
	0.1	0.132	37
7/30-8/6	9.2	0.131	37
	5.8	0.095	27
	4.2	0.144	41
	3.1	0.159	45
	2.0	0.106	30
	1.05	0.156	44
	0.62	0.094	27
	0.43	0.085	25
	0.1	0.069	20
8/6-8/12	9.2	-	-
	5.8	0.156	44
	4.2	0.137	39
	3.1	0.125	35
	2.0	0.129	36
	1.05	0.133	37
	0.62	0.110	31
	0.43	0.136	39
	0.1	0.138	39



**Aethalometry**  
Chicago, IL (2001)

